University of Karlsruhe
Institute of Stochastics

Prof. Dr. P. R. Parthasarathy
Dipl.-Math. D. Gentner

Stochastic Methods in Industry I (WS 07/08)

Problem Set 7

Problem 1

Draw the graphs of $P_0(t), P_1(t), P_2(t), P_3(t), P_4(t)$ and $m(t)$ for an $M/M/1/4$ queueing system. (You are free in the choice of the parameters.)

Problem 2

In a parking lot there are N parking spaces. Cars arrive according to a Poisson process with mean 10 per hour. The parking time is exponentially distributed with mean 10 minutes. For $N = 2, 4, 8, 10$, compare the expected number of empty parking spaces and the effective arrival rates.

Problem 3

There are two cab companies. Each of the two companies owns two cabs. The arrival rate of customers for each company is 8 per hour. The time per ride is exponential with mean of 12 minutes.
(a) Find the expected waiting time W_q in the queue for each company.
(b) A businessman buys both companies and consolidates the two companies into one. Find W_q in the new setup.
(c) If in addition, the businessman imposes a restriction on the number of waiting customers to 6, find W_q and the percentage of lost customers.

Problem 4

A company is trying to decide on the number of repairmen to service its 20-machine shop. The mean lifetime of one machine is exponential with mean 6 minutes. The repair time is exponential with mean 3 minutes. Find the expected amount of time a machine spends starting right after a breakdown until it is repaired again if the number of repairmen is 4 and if it is 6.

Due date Friday, December 14th 2007, 14:00 o'clock. Sheets can be turned in right before class. Please put your **name** and **student id number** on each sheet you turn in and staple the sheets.